REMARKS/ARGUMENTS

In the specification, the first four paragraphs of the section DETAILED DESCRIPTION OF THE INVENTION, starting on page 5 and ending on page 6, have been amended to call out a new numerations and re-numerations of features which are depicted in Drawings 1 and 2. Two features which were called out in the text of the specification but were not numerated in Drawing 1 are now numerated. Three features which were called out in the text of the specification but were not numerated in Drawing 2 are now numerated.

In amended Drawing 1, the previously un-numerated features of the control wavelengths and the data wavelengths are now numerated and a re-numeration has been established according to the order of descriptive occurrence within the specification.

In amending Drawing 2, the previously un-numerated features of the Burst Assembly and Burst Disassembly buffers and the Class of Service queues are now numerated. In addition, selected text callouts in Drawing 2 are corrected.

The examiner has acknowledged that claims 1 – 5 are allowed, however, minor modifications are made now to more distinctly claim the subject matter of the inventions.

Claim 1 is currently amended to insert "containing ~~the~~ addressing information identifying an" to more specifically indicate that the PDU carries addressing information indicating the PDU's destination egress node. (NOTE: This claim was also previously amended to read.... "means for processing ~~performing optical signal to electrical signal conversion on~~ the labeled optical..". Claim 1 if further amended "said control packet containing at least addressing information, and the initial delay of the optical burst with respect to the control packet, and the initial delay of the optical burst with respect to the control packet, and, but not limited to, optionally containing class of service and quality of service parameters," to clarify the minimum additional and some optional information content within the control packet, so as to explicitly differentiate said control packet from an MPLS or IP header.

Claim 2 is currently amended in a manner to match the prior and current amendments to Claim 1, i.e. "means for processing ~~performing optical signal to electrical signal conversion on~~ the labeled optical ..." And, "containing addressing information identifying an" to more specifically indicate that the PDU carries addressing information that allows identification of the PDU's destination egress node. Claim 2 is further amended "said control packet containing at least addressing information, and the initial delay of the optical burst with respect to the control packet, and the initial delay of the optical burst with respect to the control packet, and, but not limited to, optionally containing class of service and quality of service parameters," in the manner and for the reasons cited in argument of claim 1.

Claim 4 is currently amended to eliminate "~~such as electronic label switching routers~~". Argument: An exhaustive listing of Protocol Data Unit (PDU) devices cannot be produced but PDU devices can be defined. A PDU device is any device that generates, routes,

switches, receives or otherwise acts on or transmits Protocol Data Units. PDUs are defined as any finite data set which is formatted for transmission by one or more networking protocols. A non-exhaustive listing of example PDUs are Ethernet packets, ATM cells, IP packets, SONET Frames, Digital Wrappers, Frame Relay Data Frames, MPLS Packets, GMPLS Packets or Frames, etceteras.

Claim 5 is currently amended to eliminate "~~such as electronic label switching routers~~"in the manner of and for the reasons given in argument for claim 4.

The examiner has rejected claims 6 – 9 for reasons of indefiniteness of subject matter and informalities (claims 7 & 8) and for anticipation (claims 6 – 9). The following addresses each claim in order of occurrence and include minor modifications to more distinctly claim the subject matter of the inventions as well argument and illustration of the additions of art not anticipated, and subtractions of art that prior arts cannot replicate, that are claimed in 6, 7, 8 and 9.

Claim 6 is currently amended to insert control wavelength(s) of the so as to more specifically indicate that the control packet processor is connected to control wavelength(s) (an addition of art) on which the control packets travel, these wavelength(s) being distinct (i.e. out-of-band) addition(s) to the (art) data wavelength(s) over which the optical bursts (i.e. assembled PDUs) travel.

In addressing the reasons for rejecting claim 6, the key differences between the methods of Claim 6 as proposed by this application (hereinafter known as QIAO) and the specification of CHANG, Patent No. 6,545,871, are as follows:

a. QIAO uses Out-of-Band Control Wavelengths for the transmission of control packets – CHANG specifically remains In-Band. In CHANG, "In accordance with the present invention, the optical packet header is carried over the same wavelength as the packet payload data".i.e. control information is transmitted via an in-band method. A comparison of Drawing 4 of CHANG with a QIAO modification of CHANG's Drawing 4 clearly illustrates that the out-of-band approach is distinct and an addition not disclosed by CHANG. QIAO Drawing 1 (with comments) also makes clear the additions and subtractions of art.

b. In CHANG, "...use of optical delay at each intermediate optical switch, [it (CHANG)] eliminates the need to estimate the initial burst delay by incorporating the optical delay directly at the local switches." In contrast, QIAO purposefully delays the sending of a burst and includes this delay information into the control packet so as to avoid the requirement of optical delay at intermediate nodes.

The elimination of fiber delay lines has the largest positive impact on network performance and burst loss probability under load. Electronic IP routers (or similar devices) use 100's of megabytes to gigabytes of specialized high speed buffer memory to store incoming packets while their respective headers get processed. In this, they are similar to CHANG but have the advantage of greater storage capacity and random access so that a data packet (or burst) can be stored for any desired length of time before re-launching with its newly modified header. CHANG's fiber delay lines (FDLs) however only offer discreet delay times associated with the time of signal travel and the delay loop length. Fiber delay lines are also not physically suitable for creating 100's of megabytes to gigabytes of random access memory and under no circumstances are they functionally equivalent. QIAO in contrast to CHANG proposes a method that allows the network to carry high loads without any burst delay devices. By delaying the initial launch of a data burst, QIAO is able to take advantage of the 100's of megabytes to gigabytes of random access memory located at the electronic edge of the network. The data burst is delayed at the edge (substituting for the distributed random access delay approach of electronic routers) while the control packet is sent forward through the network on a control wavelength where it is processed all electronically. The degrees of delay freedom at the edge are greater than the degrees of delay freedom offered by a distributed number of discrete delay optical delay devices, (i.e. FDLs); a benefit that lowers the networks overall burst loss probability. QIAO goes further to take advantage of any distributed optical delay devices that might exist, by using them for contention resolution and thereby further lowering the burst loss probability.

c. In addressing a specific reason for rejection of claim 6, CHANG's disclosure of a label switch controller with look-up table and circuit switching controller ....and....the IP router 111.... is an example of similar words but insufficient functionality to anticipate QIAO. **Argument**: The inclusion of burst delay information into the control packet and the delay of the transmission of the burst for some offset time after the transmission of the control packet calls for explicitly different and additional functionality versus an IP router. It requires that the control packet processor examine the control packet arrival time at the control packet processor and the burst delay information within the control packet, so as to determine the time when the burst will be arrive at the switching

> device. Once said arrival time of the optical burst has been determined the control packet processor then has to schedule a reservation of the switching device so that at said arrival time in the future when the burst arrives at the switching fabric, the switching device is already properly configured having become so just before the burst arrives. Once the control packet processor has successfully scheduled a future reservation of the switching fabric, the control packet is updated and sent to the next downstream node before the burst ever arrives at the switch fabric. The burst then traverses from node to node without ever being delayed to allow for a control packet to be processed. The burst

Claim 7 is currently amended "~~a~~ the Wavelength.." and "~~a~~ the control .." to specifically indicate that the subject matters of claim 7 is the same subject matters cited in claim 6. Claim 7 is further amended to "PDU devices~~, such as electronic switching routers~~" to clarify its metes and bounds in the manner of and for the reasons given in argument for claim 4. Claim 7 if further amended to "control wavelength(s) of the" in the manner of claim 6.

Regarding the reasons for rejection of claim 7, there is no correlation between a burst assembly unit and "an optical circulator, responsive to the incoming optical signal, for circulating the light burst to produce a time extended light burst under control of the preamble, see claim 32". The latter is more commonly known as a fiber delay line (FDL) and is used delaying the optical burst (while keeping it in the optical domain) at an intermediate node while its associated header (also part of this same optical signal) is detected, processed and subsequently replaced. In contrast, burst assembly in a LOBS network is an all electronic function that only occurs at the ingress node prior to the creation of the optical burst as an optical signal. PDU's incident on an ingress LOBS node are aggregated by the burst assembly unit into electronic queues according to their destination egress node (see Drawing 2 and Claim 1) and Class of Service. The aggregated PDUs remain in electronic memory at the ingress edge of the network until the initial delay following the sending of the burst's control packet has elapsed. At that time, the data is optically launched as an optical burst along a data wavelength and is completely separated in time and wavelength from its control packet. Again in contrast, in CHANG, the header and the data payload are part of the same optical signal (CHANG Claim 1) "adding a header to the data payload prior to inputting the data payload to the input network element to produce an optical signal". In summary, as there is no correlation in either the function performed, the benefit obtained, or the method employed, then there is no anticipation of one due to an earlier record of the other.

Claim 8 is currently amended "~~a~~ the Wavelength.." and "~~a~~ the control .." to specifically indicate that the subject matters of claim 8 is the same subject matters cited in claim 6. Claim 8 is further amended to "PDU devices~~, such as electronic switching routers~~" to clarify its metes and bounds in the manner of and for the reasons given in argument for claim 4. Claim 8 if further amended to "control wavelength(s) of the" in the manner of claim 6.

Regarding the reasons for rejection of claim 8, there is no correlation between a burst dis-assembly unit and a demodulator, see claim 34. The demodulator is explicitly used for

frequency demodulating the electrical signal of the header information once it has undergone optical-to-electronic conversion into an electronic signal. CHANG uses different modulation frequencies to encode multiple headers (typically an address stack) into a single multi-frequency analog signal which is then transmitted as a modulation on top of (or immediately preceding and perhaps separated by a guard band), the optical burst signal data but still as part of the overall optical burst signal produced. CHANG does this to facilite the detection, removal and re-insertion of headers onto optical bursts. This header modulation causes the multiple headers assigned to a burst (in CHANG) to be temporally overlapped with each other as a single multi-frequency optical signal with different headers being represented by information encoded at the different frequencies. This signal which is then inserted into the optical burst has to subsequently be detected and demodulated in order to separate the headers when processing them at an intermediate node. Note -- CHANG does not modulate or demodulate the data bursts themselves. In contrast, in QIAO, control packets are directly digitally represented in the optical domain in the manner typical industry practice. No requirement is made for frequency modulation or demodulation or any other means of further encoding and decoding of control packets. In addition, control packets are distinctly separate optical signals from their respective data bursts, i.e. they are widely separated in time and wavelength from their respective bursts. Once a control packet's information undergoes optical-to-electronic conversion, (via a optical to electronic transducer), no additional decoding is necessary for the control packet processor electronics to read the control packet information. Address stacks within a control packet are digitally and serially formatted in the same manner as existent industry practice for formatting address stacks within a typical electronic MPLS router.

Furthermore, in QIAO, burst dis-assembly is an operation that is only performed on the burst data (as opposed to on a control packet). This occurs only at the egress edge of the optical domain after the optical burst has arrived at its egress node and has been converted back into electronic digital data. No modulation or demodulation is used as the PDU's were per industry standard practice, serially concatenated within the data burst. In this dis-assembly unit, the various PDUs which were originally concatenated to make a burst, are now de-concatenated into individual PDU's for forwarding to their respective destination PDU devices attached to this egress node. Unlike CHANG, no information is gleaned from the the burst dis-assembly operation to assist in routing the burst through the LOBS network since (unlike CHANG) the burst has already traversed the network. In summary, as there is no correlation in either the function performed, the benefit obtained, or the method employed, then there is no anticipation of one due to the other.

Claim 9 is not amended but is now assumed to become valid based upon the arguments that Claims 6, 7 and 8 are not anticipated by CHANG but instead that the additions of art made by QIAO and the subtractions of art enabled by QIAO's additions, establish claims 6, 7, 8 and therefore claim 9 as particularly pointing out and distinctly claming the subject matters regarded as invention in each claim.

The examiner has acknowledged that claims 10 – 17 are allowed. No modifications are made.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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Signature 

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Attachments